CLAIMS

1. A method of producing a three-dimensional structure, comprising the steps of: arranging a substrate close to a tip of a needle-shaped fluid-ejection body, having a fine diameter, supplied with a solution; ejecting a fluid droplet having an ultra-fine diameter toward a surface of the substrate by applying a voltage having a prescribed waveform to the needle-shaped fluid-ejection body; making the droplet fly and land on the substrate; and solidifying the droplet after the fluid droplet is landed on the substrate.

2. The method of producing a three-dimensional structure according to claim 1, wherein an electric field is focused at a solidified substance formed of previously landed droplet, and a subsequent droplet is stacked on said solidified substance.

3. The method of producing a three-dimensional structure according to claim 1 or 2, wherein an electric field is focused at the top of a three-dimensional substance formed of the solidified substance of the droplet, and wherein the three-dimensional substance is grown by stacking the subsequent flying droplet on the top of the three-dimensional substance.

4. The method of producing a three-dimensional structure according to any one of claims 1 to 3, wherein a cross-sectional diameter of the three-dimensional structure is controlled by a volatile property of the droplet ejected from the needle-shaped fluid- ejection body.

5. The method of producing a three-dimensional structure according to any one of claims 1 to 4, wherein a temperature of the substrate is controlled in that the previously landed droplet on the substrate is volatilized to be hard enough for the subsequent droplet stacked thereon.

6. The method of producing a three-dimensional structure according to any one of claims 1 to 5, wherein a surface temperature of the substrate is controlled by at least one heating means selected from the group consisting of a Peltier element, an electric heater, an infrared heater, a heater using fluid such as an oil heater, a silicon rubber heater, and a thermistor, that is fixed to the substrate or a substrate supporting body.

7. The method of producing a three-dimensional structure according to any one of claims 1 to 6, wherein a surface temperature of the substrate is controlled in a range of from room temperature to 100°C.

8. The method of producing a three-dimensional structure according to any one of claims 1 to 7, wherein the fluid is a solution containing metal particulates.

9. The method of producing a three-dimensional structure according to any one of claims 1 to 7, wherein the fluid is a polymer solution.

10. The method of producing a three-dimensional structure according to any one of claims 1 to 7, wherein the fluid is a solution containing ultra-fine ceramic

particles.

11. The method of producing a three-dimensional structure according to any one of claims 1 to 7, wherein the fluid is a sol-gel solution of ceramics.

12. The method of producing a three-dimensional structure according to any one of claims 1 to 7, wherein the fluid is a low molecular weight compound solution.

13. The method of producing a three-dimensional structure according to any one of claims 1 to 7, wherein the fluid is a fluid containing at least one solution selected from the group consisting of a solution containing metal particulates, a polymer solution, a solution containing ultra-fine ceramic particles, a sol-gel solution of ceramics, and a low-molecular weight compound solution.

14. The method of producing a three-dimensional structure according to any one of claims 1 to 13, wherein a diameter of the ejected droplet is 15 μm or less.

15. The method of producing a three-dimensional structure according to claim 14, wherein a diameter of the droplet is 5 μm or less.

16. The method of producing a three-dimensional structure according to claim 14, wherein a diameter of the droplet is 3 μm or less.

17. The method of producing a three-dimensional structure according to any

one of claims 1 to 16, wherein a time required for the droplet to be dried and solidified is 2 seconds or less.

18. The method of producing a three-dimensional structure according to claim 17, wherein the time required for the droplet to be dried and solidified is 1 second or less.

19. The method of producing a three-dimensional structure according to claim 17, wherein the time required for the droplet to be dried and solidified is 0.1 second or less.

20. The method of producing a three-dimensional structure according to any one of claims 1 to 19, wherein a flying speed of the droplet is 4 m/sec or more.

21. The method of producing a three-dimensional structure according to claim 20, wherein the flying speed is 6 m/sec or more.

22. The method of producing a three-dimensional structure according to claim 20, wherein the flying speed is 10 m/sec or more.

23. The method of producing a three-dimensional structure according to any one of claims 1 to 22, wherein the steps are conducted in an atmosphere having a vapor pressure of the fluid lower than a saturated vapor pressure of the fluid.

24. The method of producing a three-dimensional structure according to any

one of claims 1 to 23, wherein a dielectric constant of the fluid to be ejected is 1 or more.

25. A three-dimensional structure having a fine diameter comprises droplets having an ultra-fine particle diameter, wherein the structure is grown by solidifying the droplets and stacking the solidified droplets.

26. The three-dimensional structure according to claim 25, wherein an aspect ratio of the structure is 2 or more.

27. The three-dimensional structure according to claim 26, wherein the aspect ratio of the structure is 3 or more.

28. The three-dimensional structure according to claim 26, wherein the aspect ratio of the structure is 5 or more.

29. The three-dimensional structure according to any one of claims 25 to 28, wherein a particle diameter of the droplet is 15 μm or less.

30. The three-dimensional structure according to claims 29, wherein the particle diameter of the droplet is 5 μm or less.

31. The three-dimensional structure according to claim 29, wherein the particle diameter of the droplet is 3 μm or less.